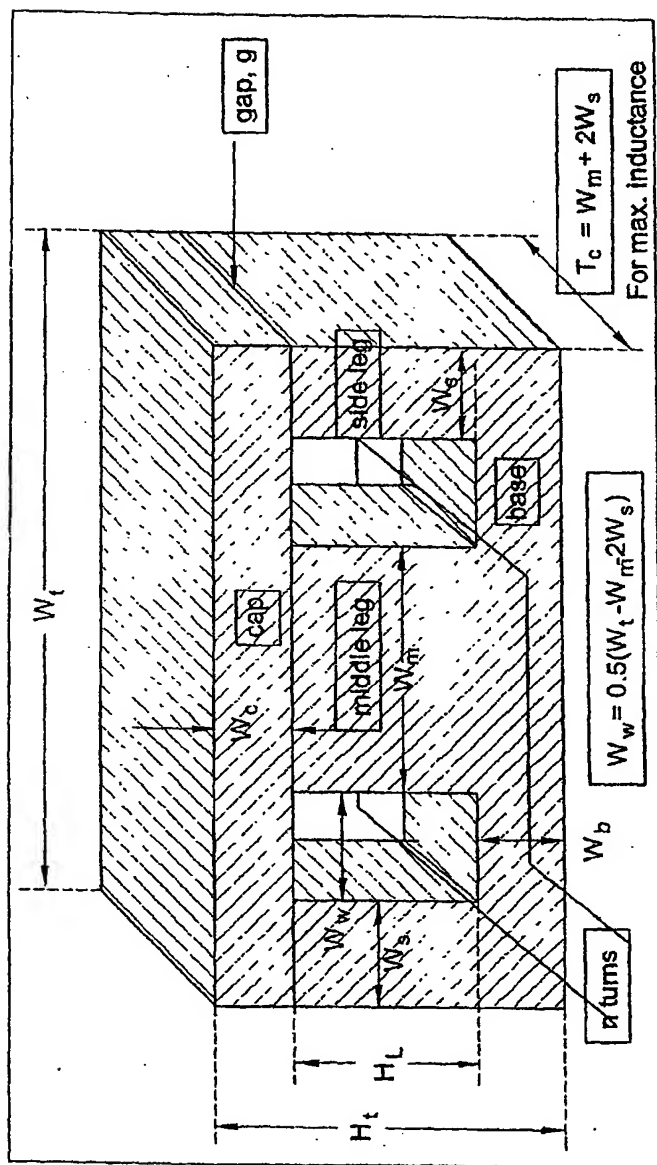


ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
METHODS FOR MAKING SAME

Philip A. Harding

Appl. No.: Unknown

Atty Docket: MFLEX.007A



Ferromagnetic E core with a matching ferromagnetic cap

FIG. 1

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
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TOROID TRANSFORMER

Top View

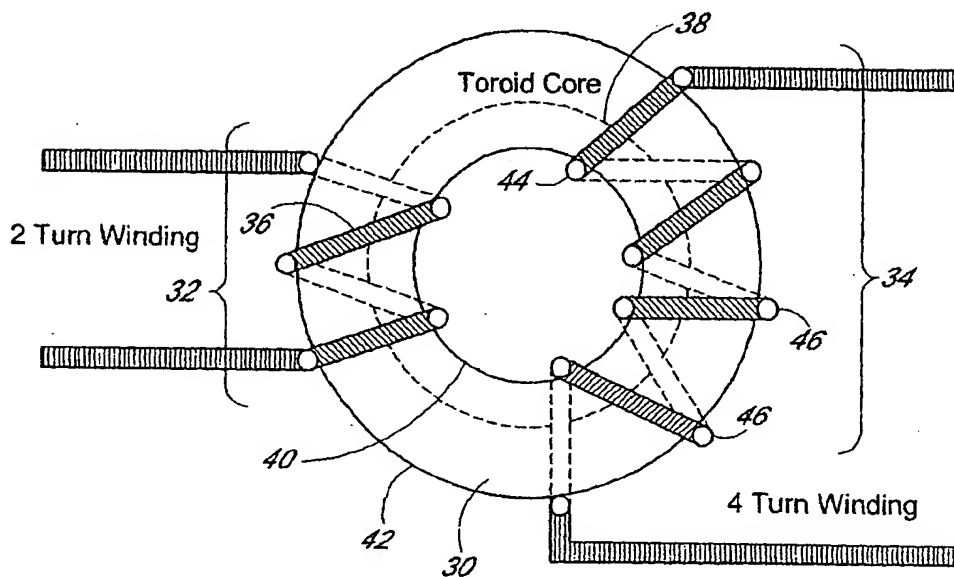


FIG. 2A

Side View

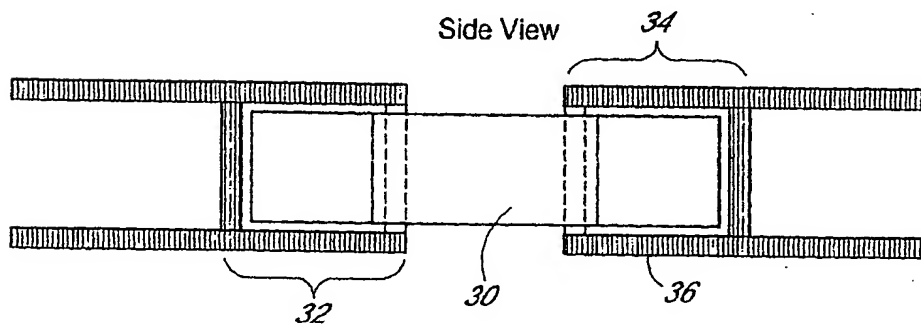


FIG. 2B

*ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
METHODS FOR MAKING SAME*

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Ferromagnetic Slab with 25 Vias

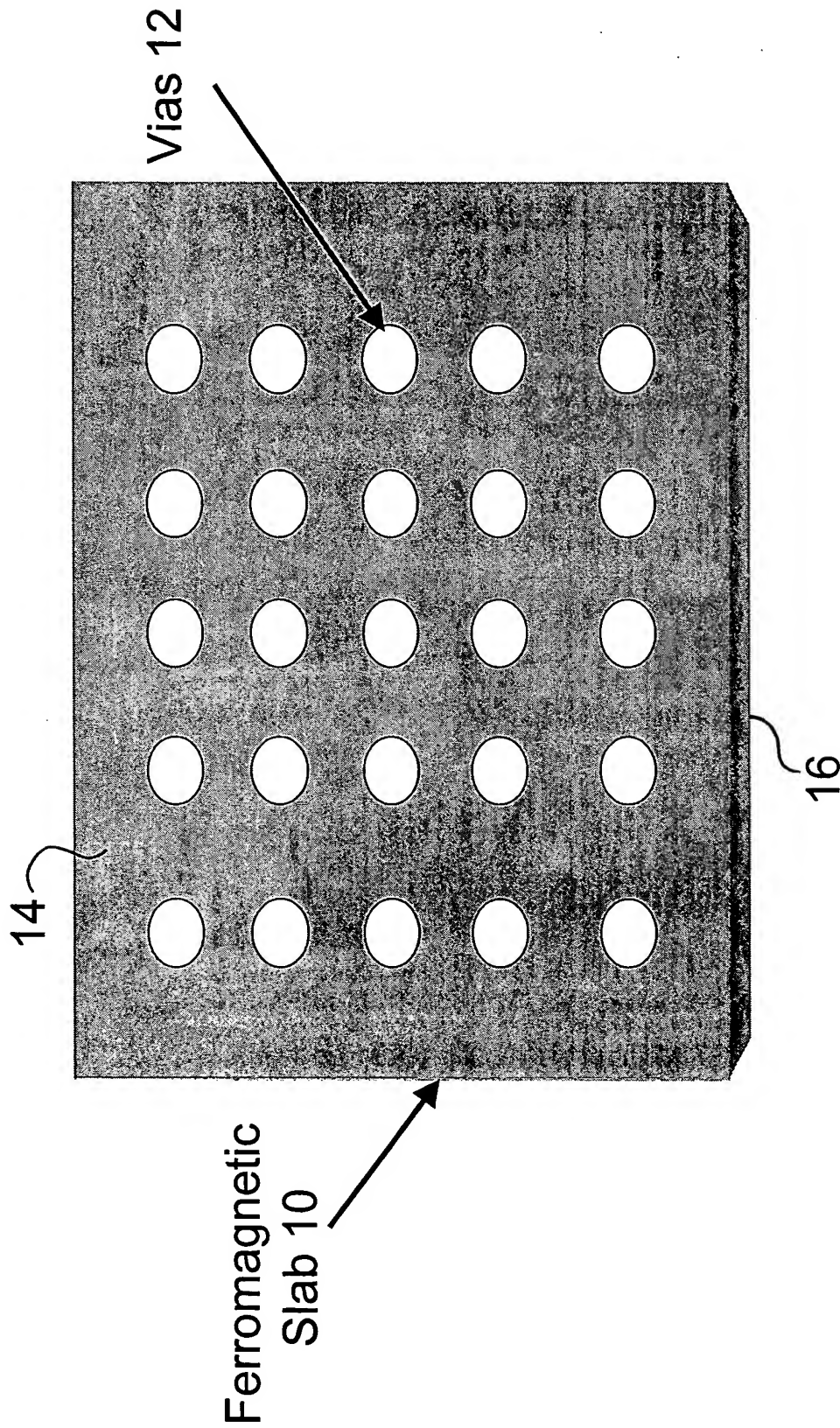


FIG. 3

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
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VIRTUAL TOROID TRANSFORMER

Top View

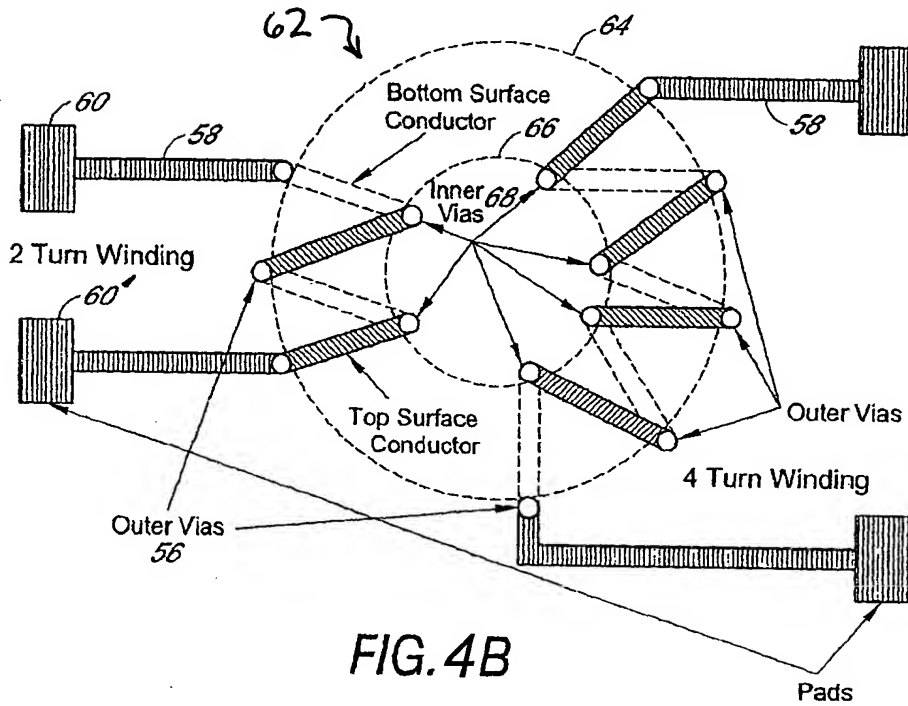


FIG. 4B

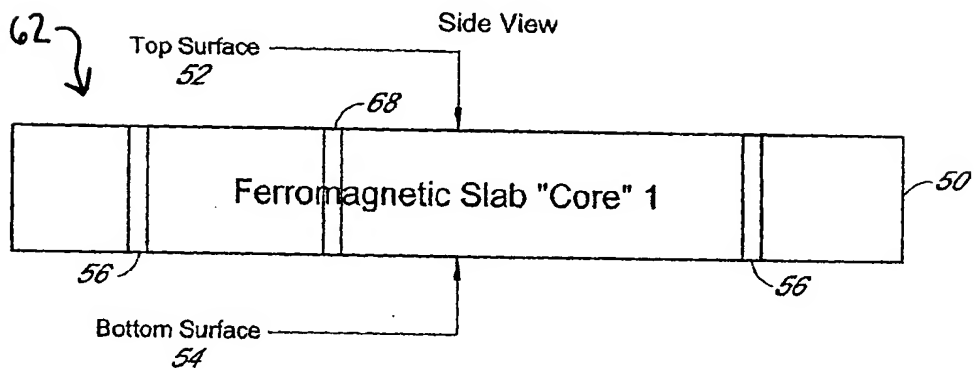


FIG. 4A

VIRTUAL TOROID & RECTANGULAR
TRANSFORMER SAME SLAB
Top View

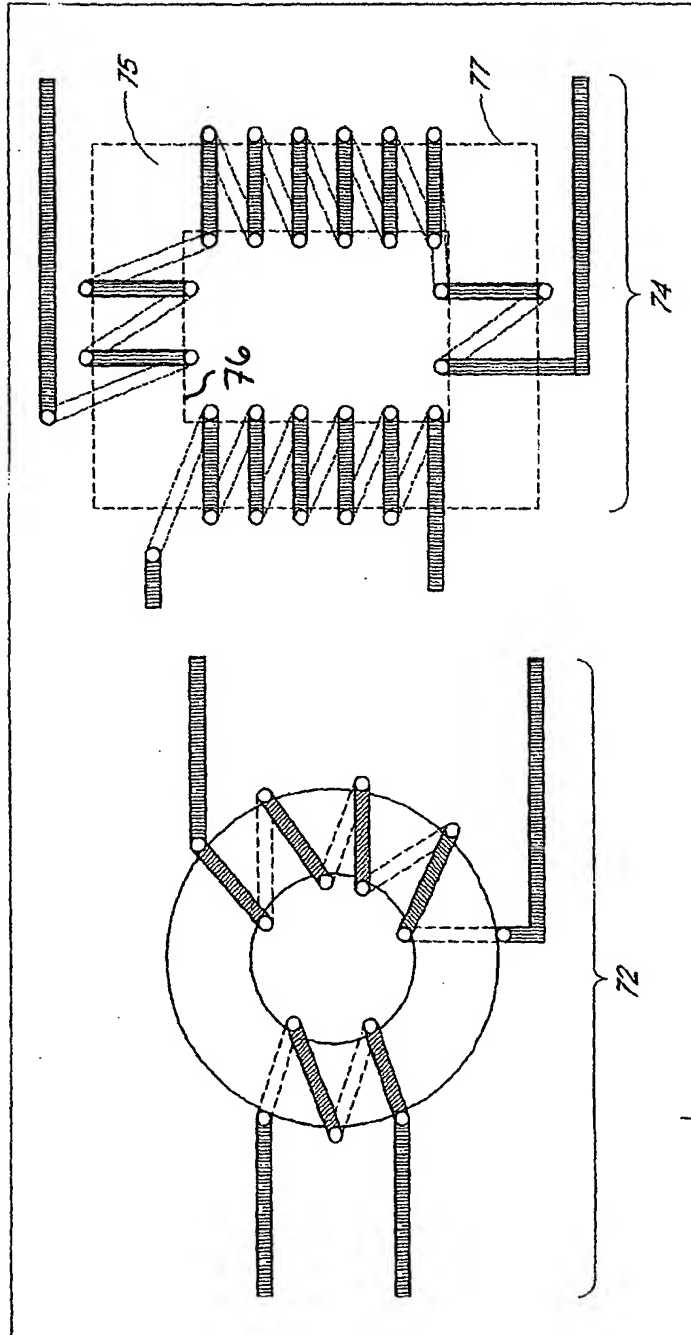


FIG. 5

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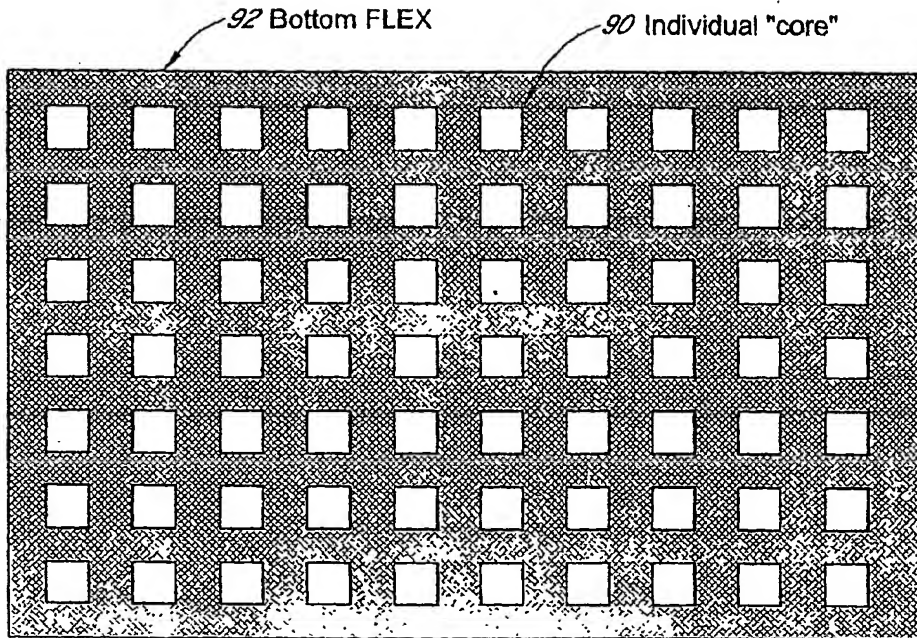
Via with current out of hole

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
METHODS FOR MAKING SAME

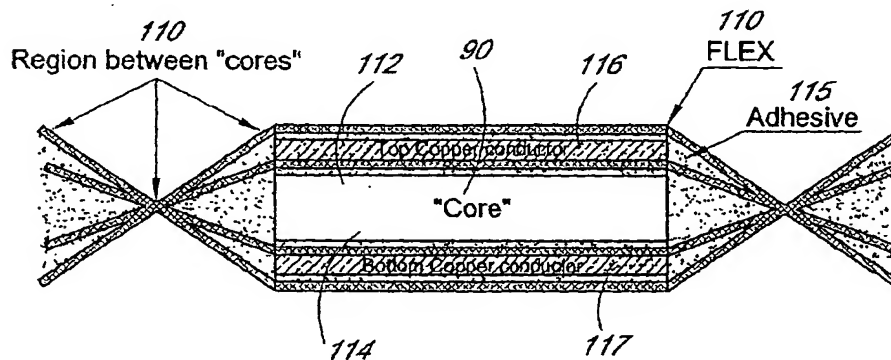
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FIG. 7



Array of 70 cores laminated onto a large panel of FLEX
(top FLEX removed to show the individual cores)



Side view showing top & bottom FLEX laminated to "core" in a panel of 70 "cores"

FIG. 8

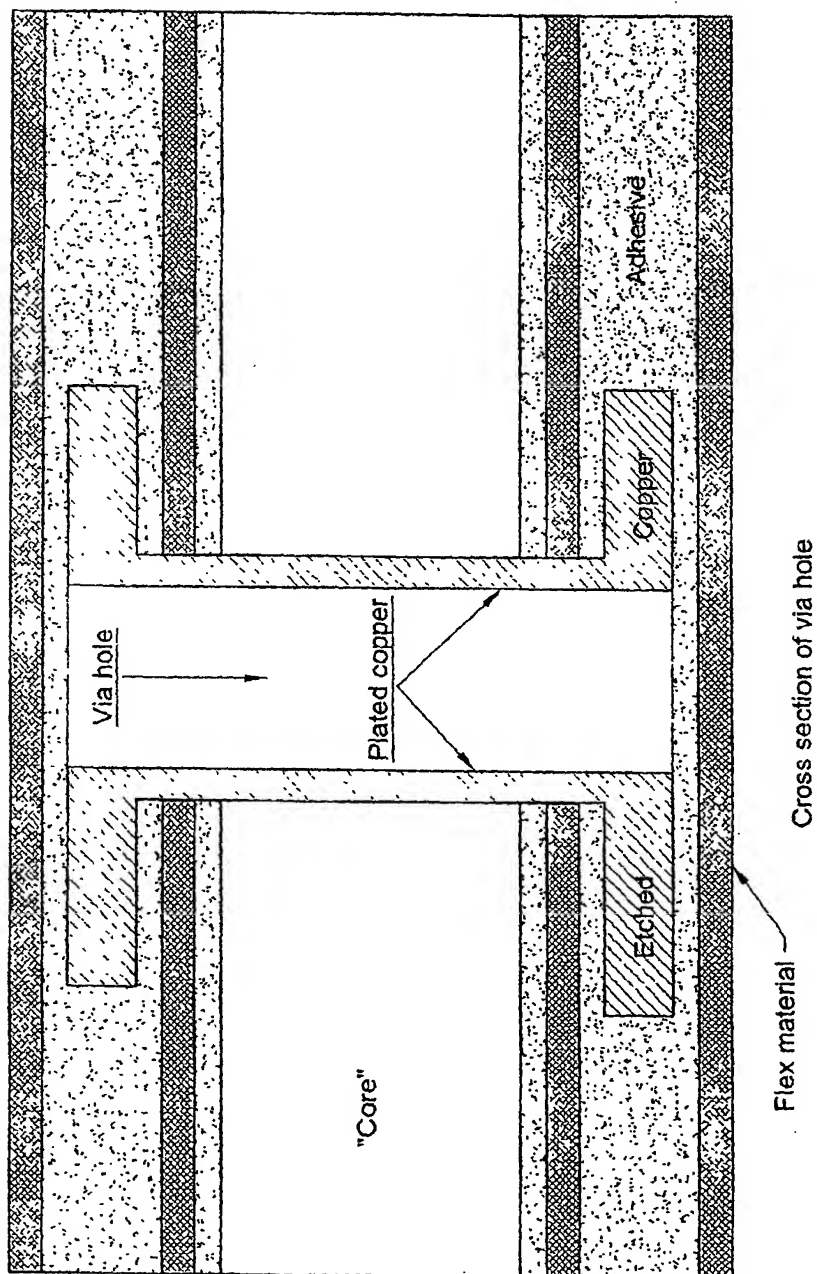
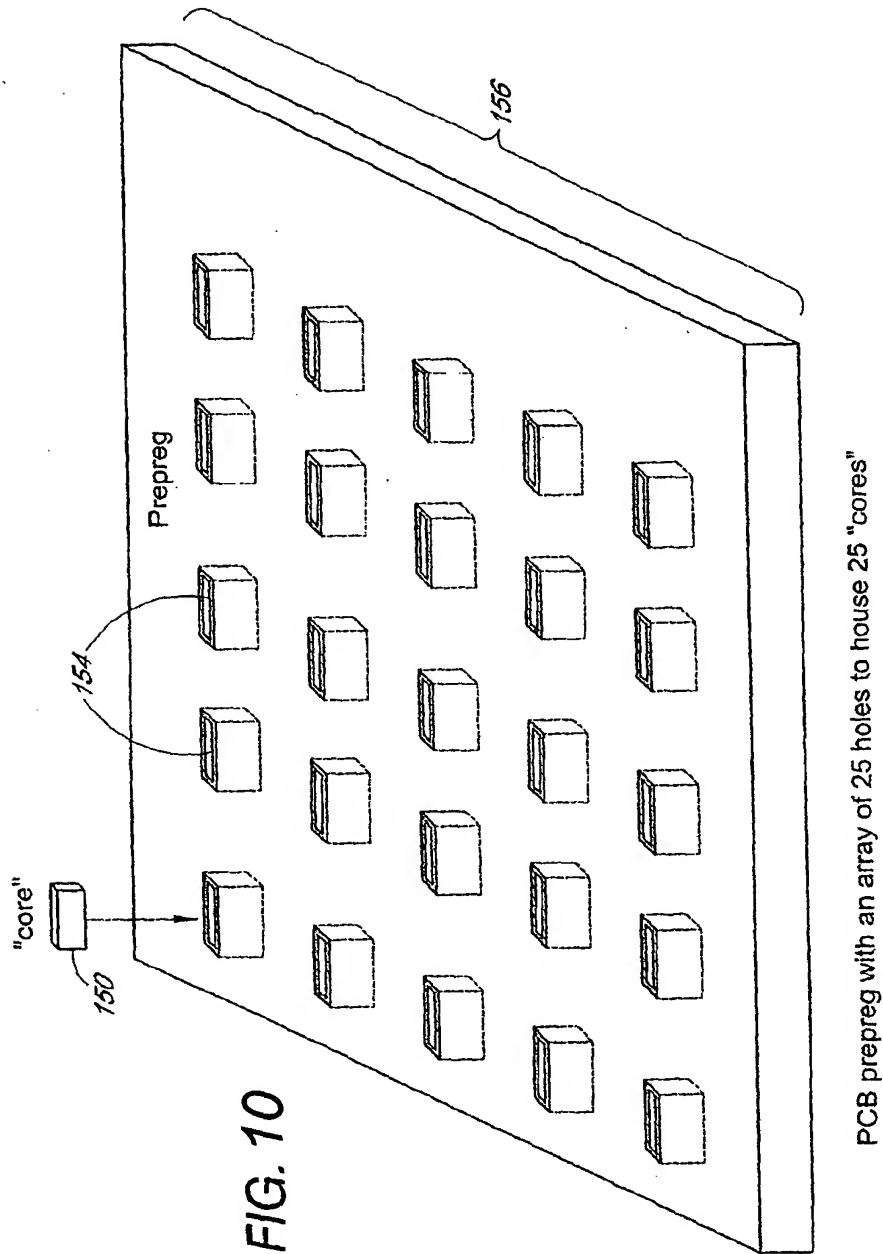


FIG. 9

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
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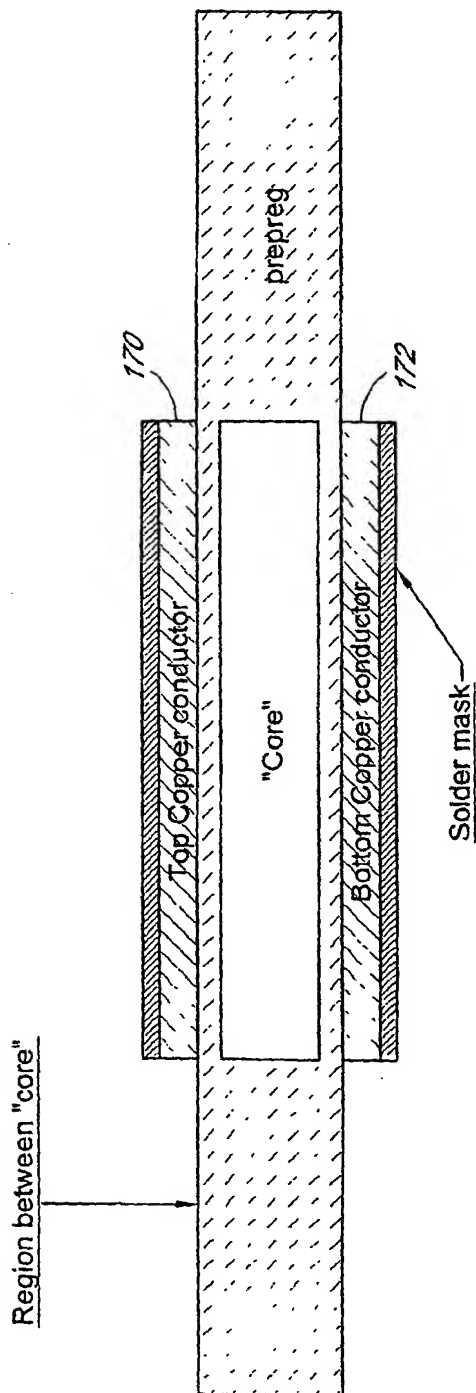


ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
METHODS FOR MAKING SAME

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Side view showing top & bottom PCB laminated to "core" in a panel of 25 "cores"

FIG. 11

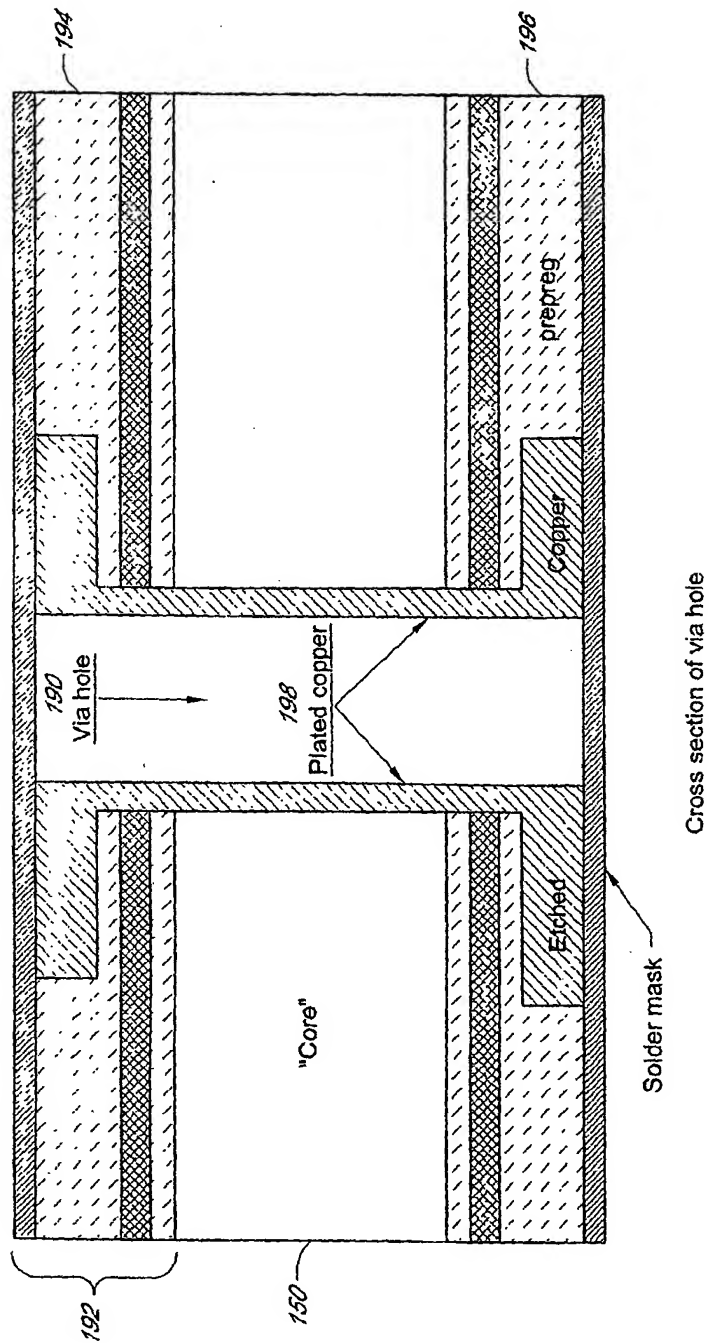
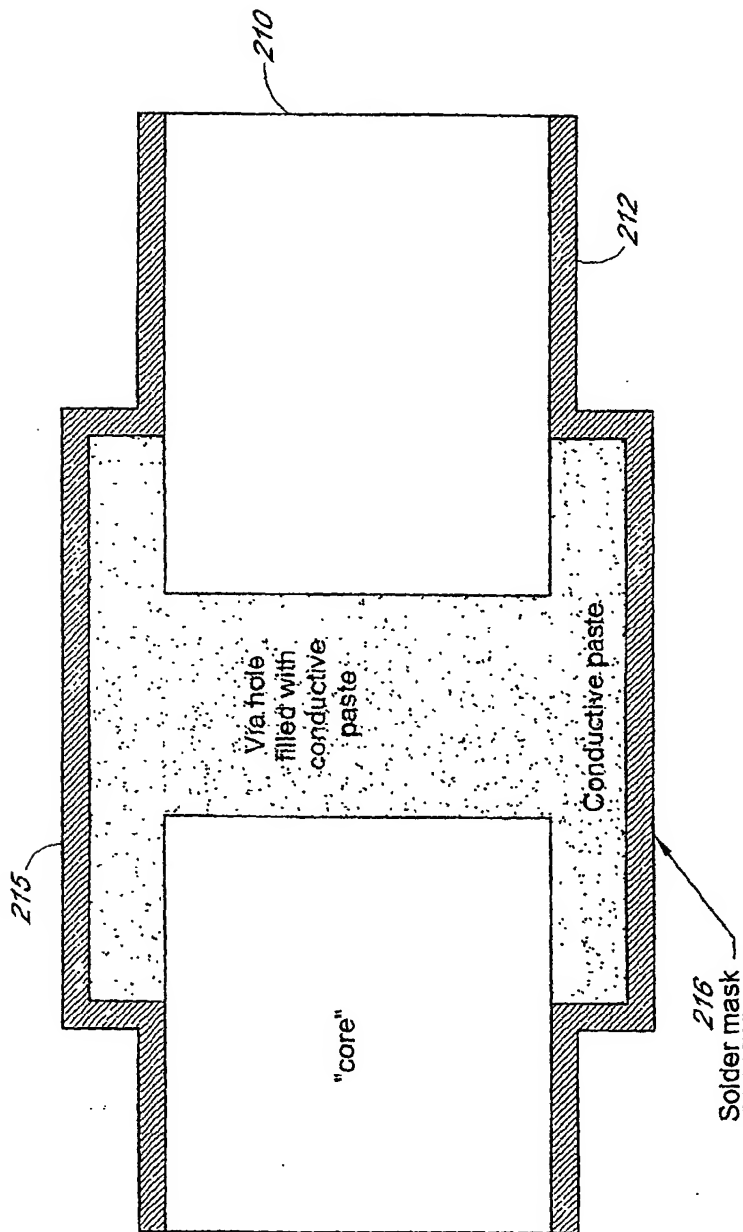


FIG. 12



Cross section of via hole of "core" with screened conductive paste

FIG. 13

Four virtual cores in same ferromagnetic slab

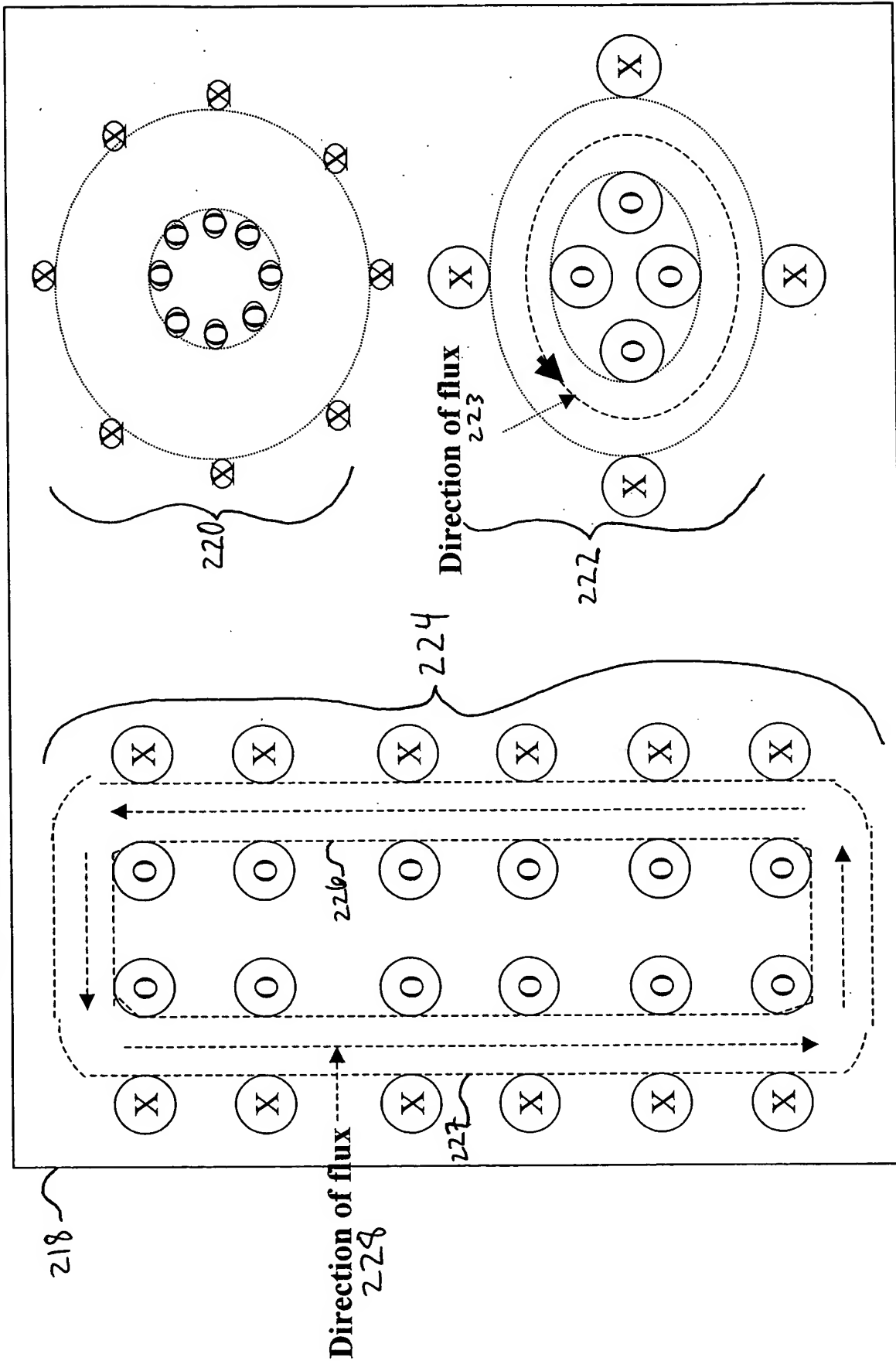


FIG. 14

 Via with current into hole
  Via with current out of hole

*ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
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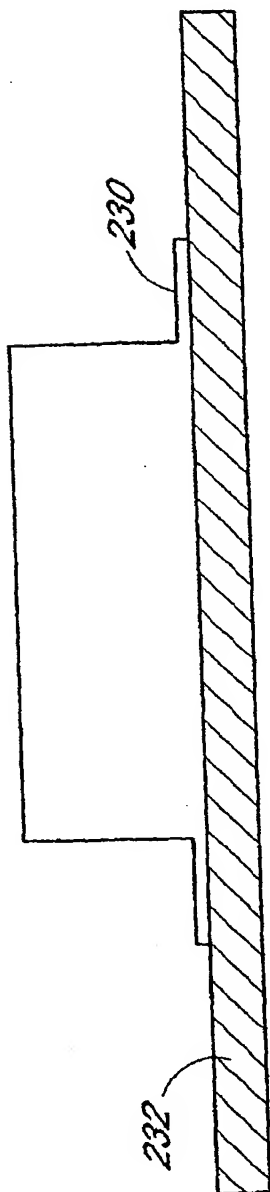


FIG. 15

*ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
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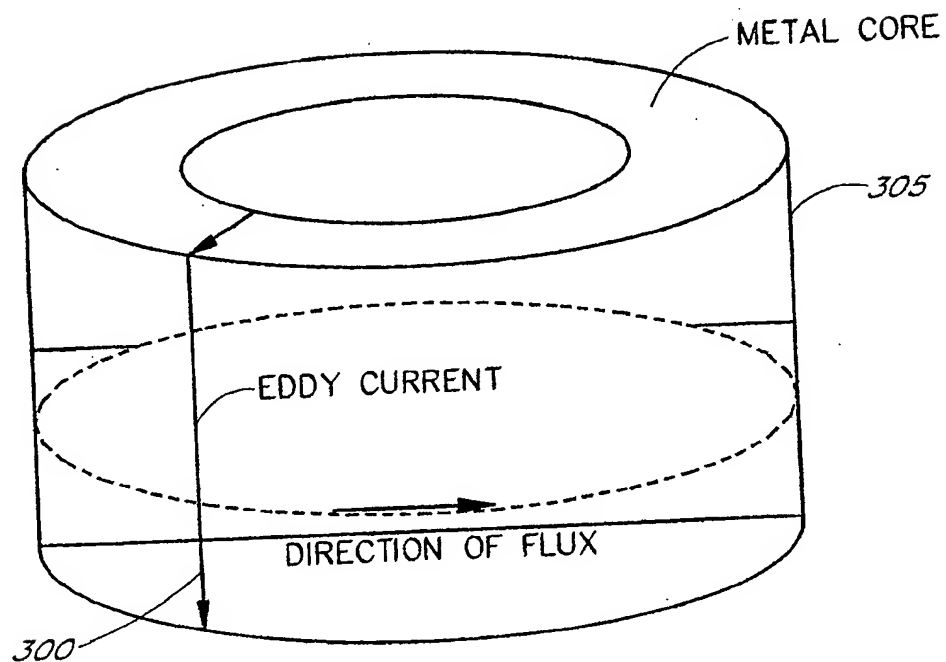


FIG. 16

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
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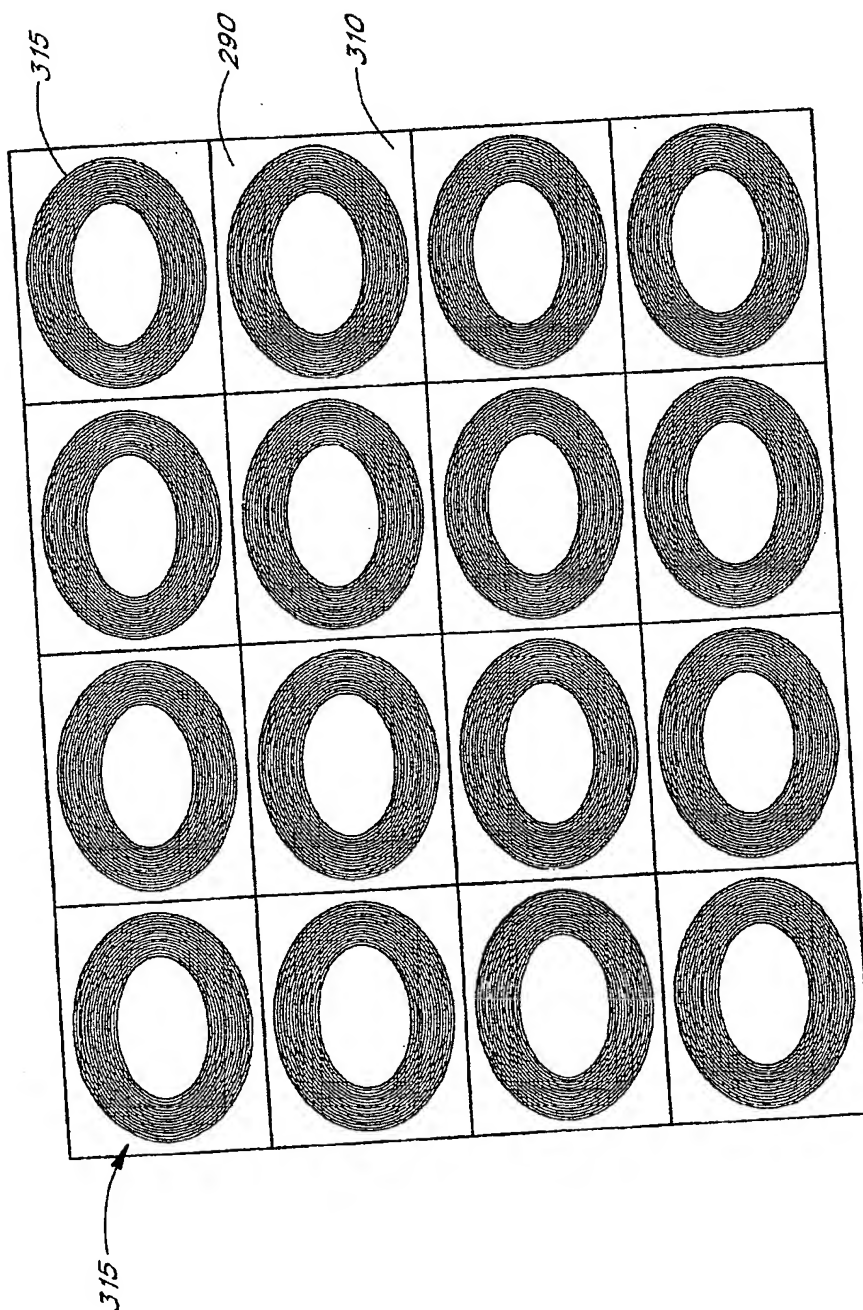


FIG. 17

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
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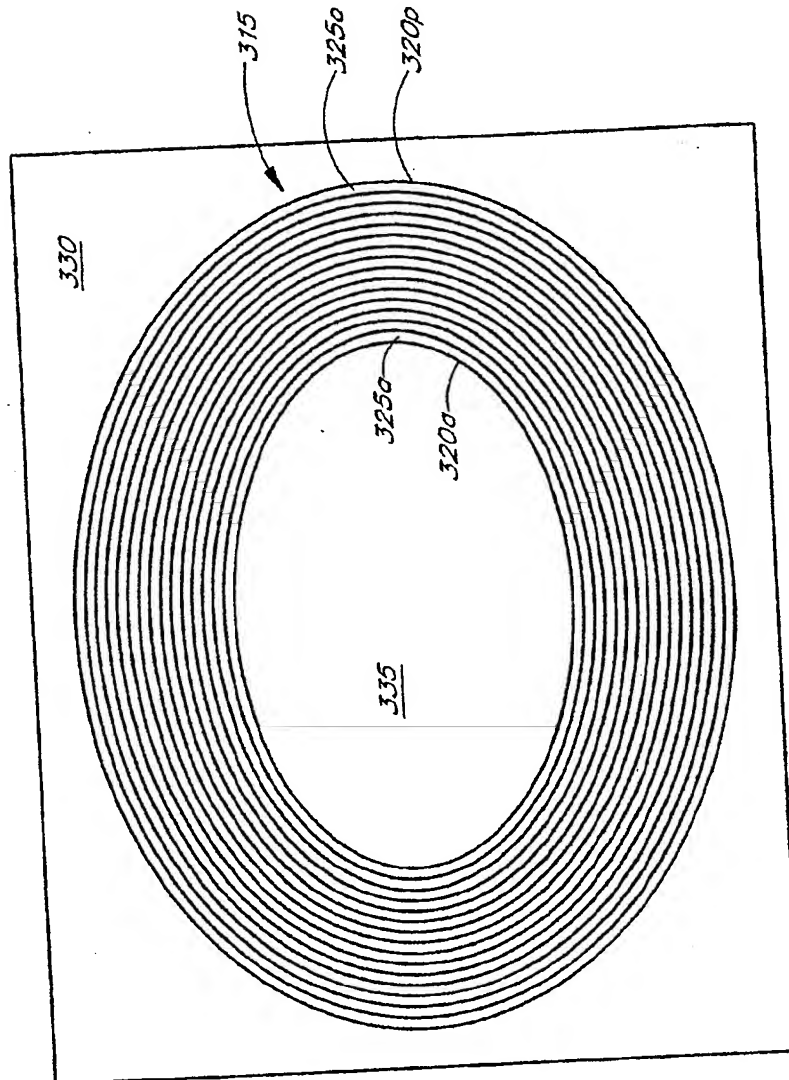


FIG. 18

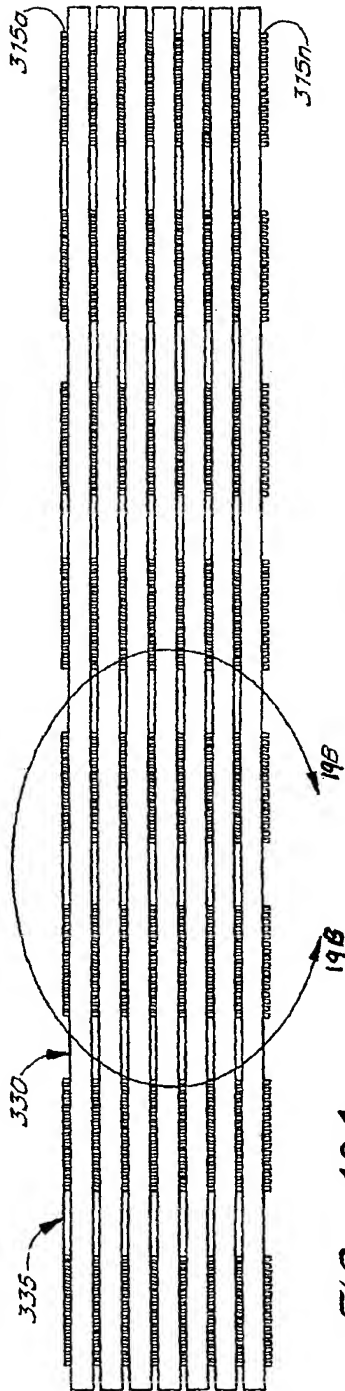


FIG. 19A

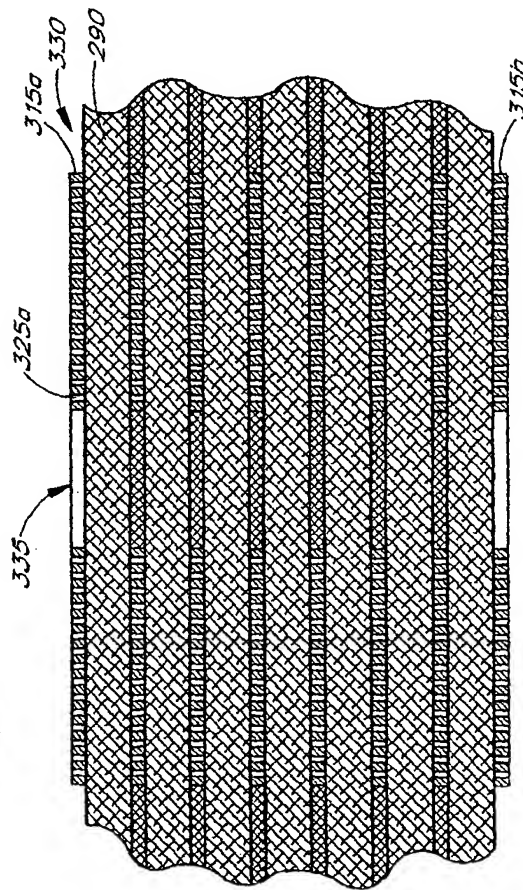


FIG. 19B

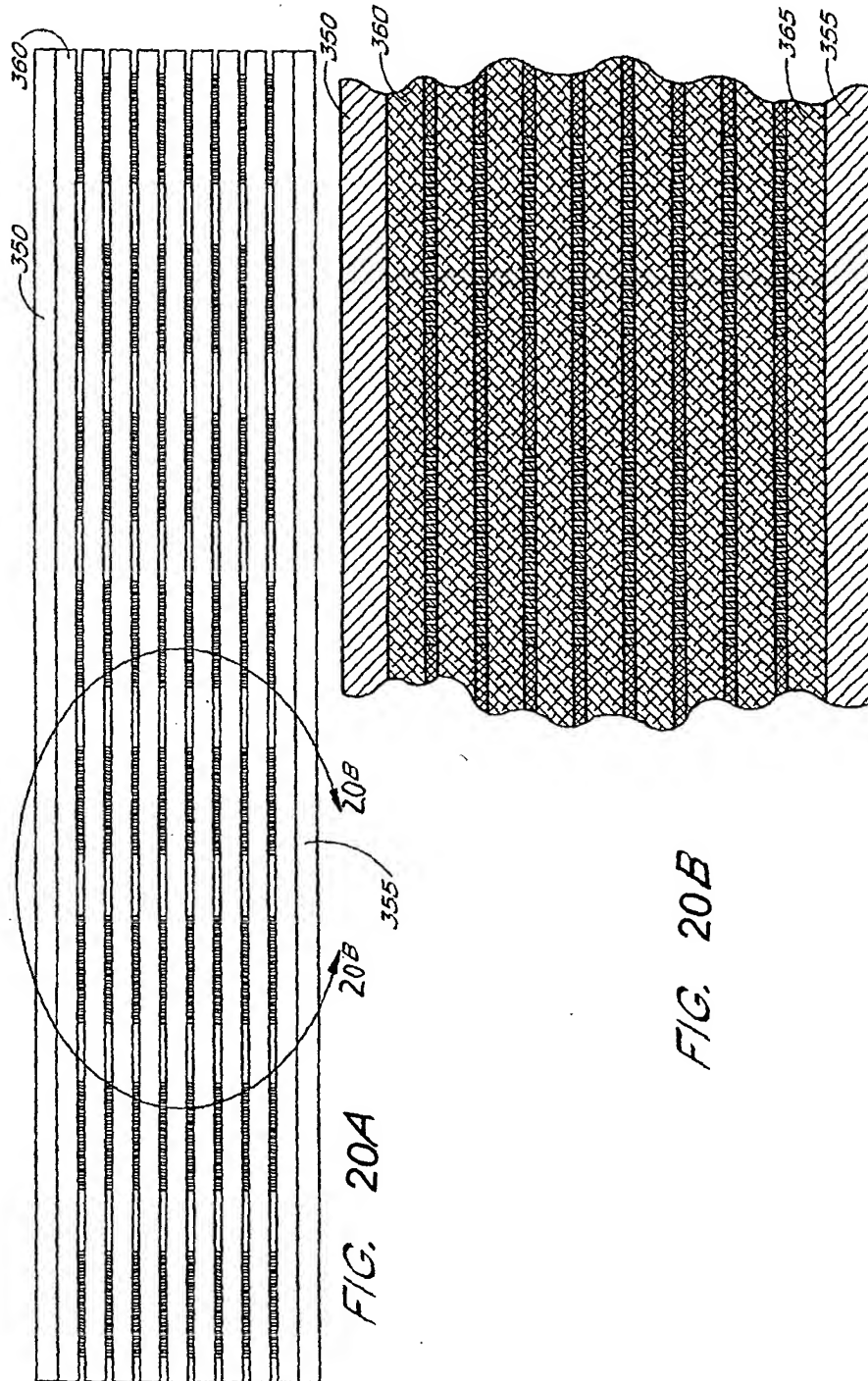


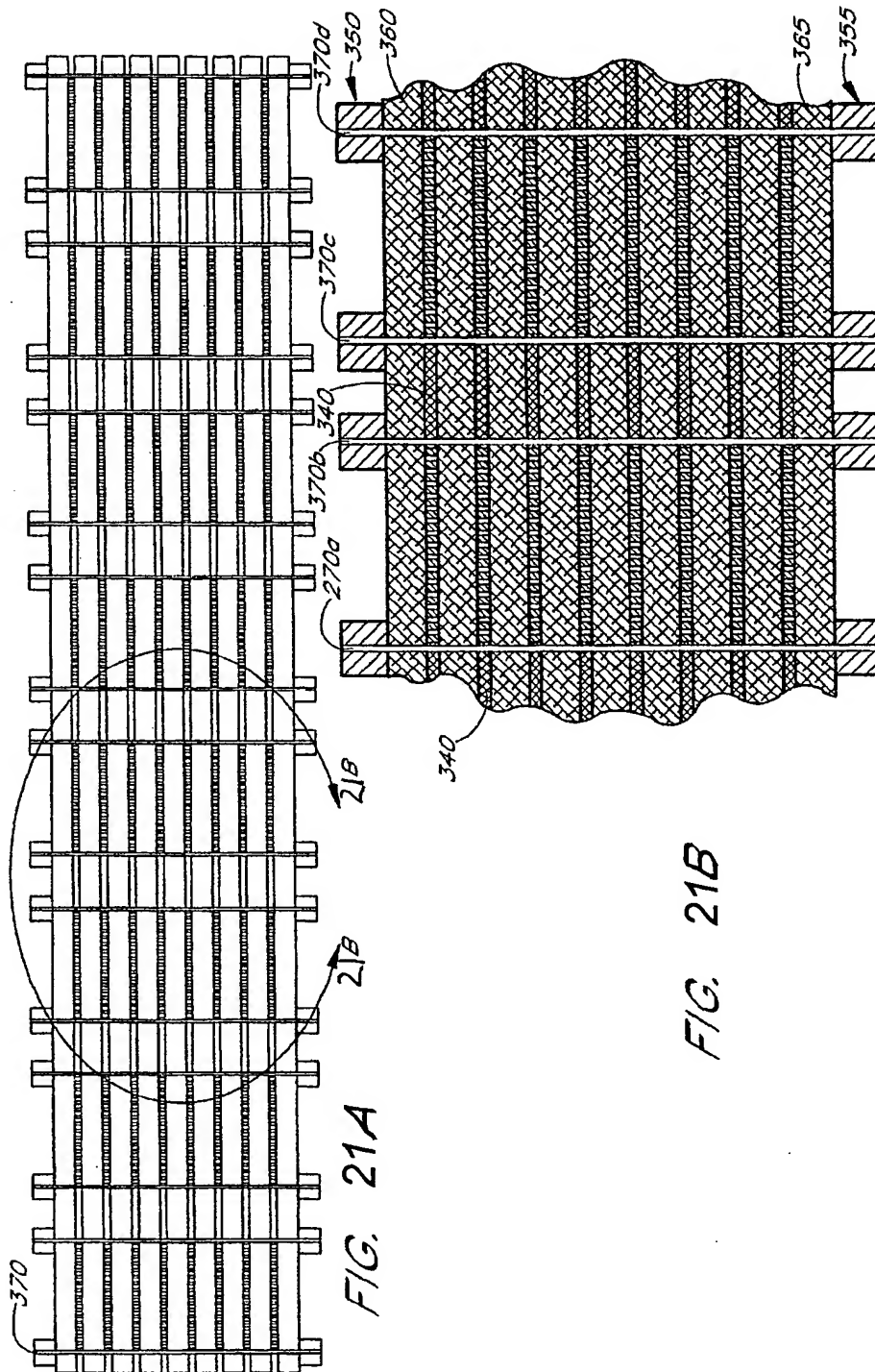
FIG. 20B

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
METHODS FOR MAKING SAME

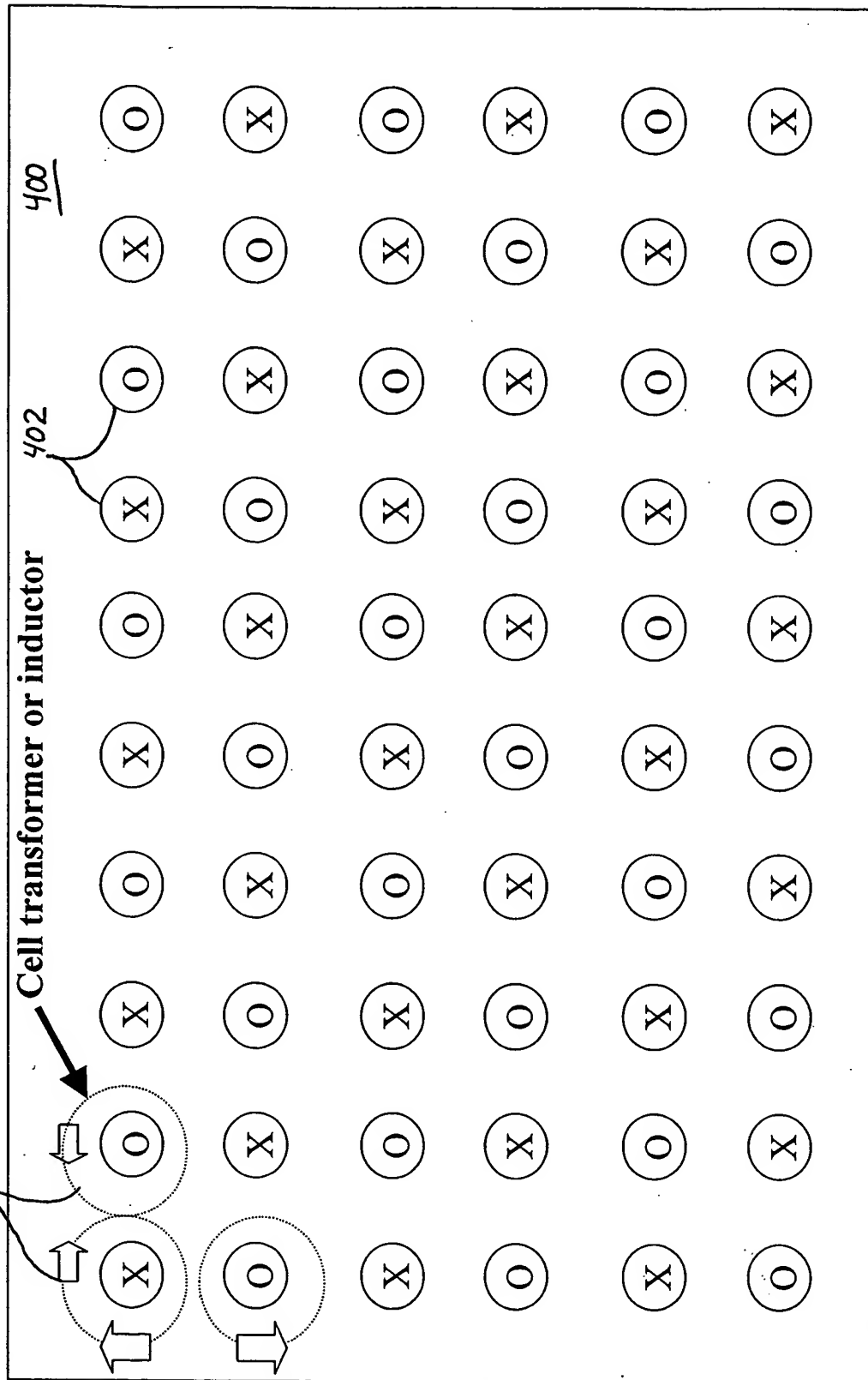
Philip A. Harding

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404



X Via with current into hole **O** Via with current out of hole

FIG. 22

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
METHODS FOR MAKING SAME

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Magnetic Flux from a Single Conductor

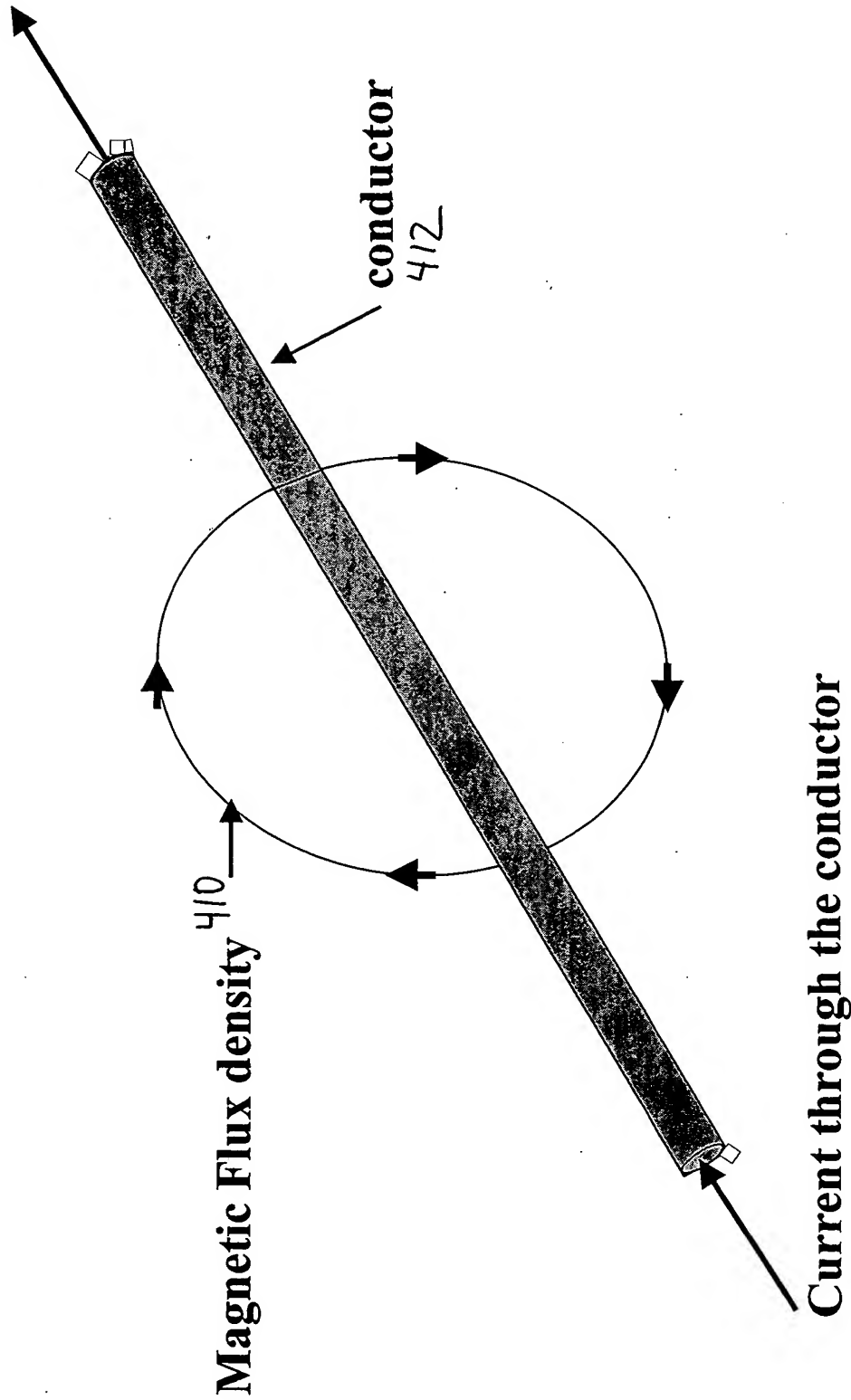


FIG. 23

ELECTRONIC TRANSFORMER/INDUCTOR DEVICES AND
METHODS FOR MAKING SAME

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Atty Docket: MFLEX.007A

Electric Field Intensity from an Enclosed area of Changing Magnetic Flux

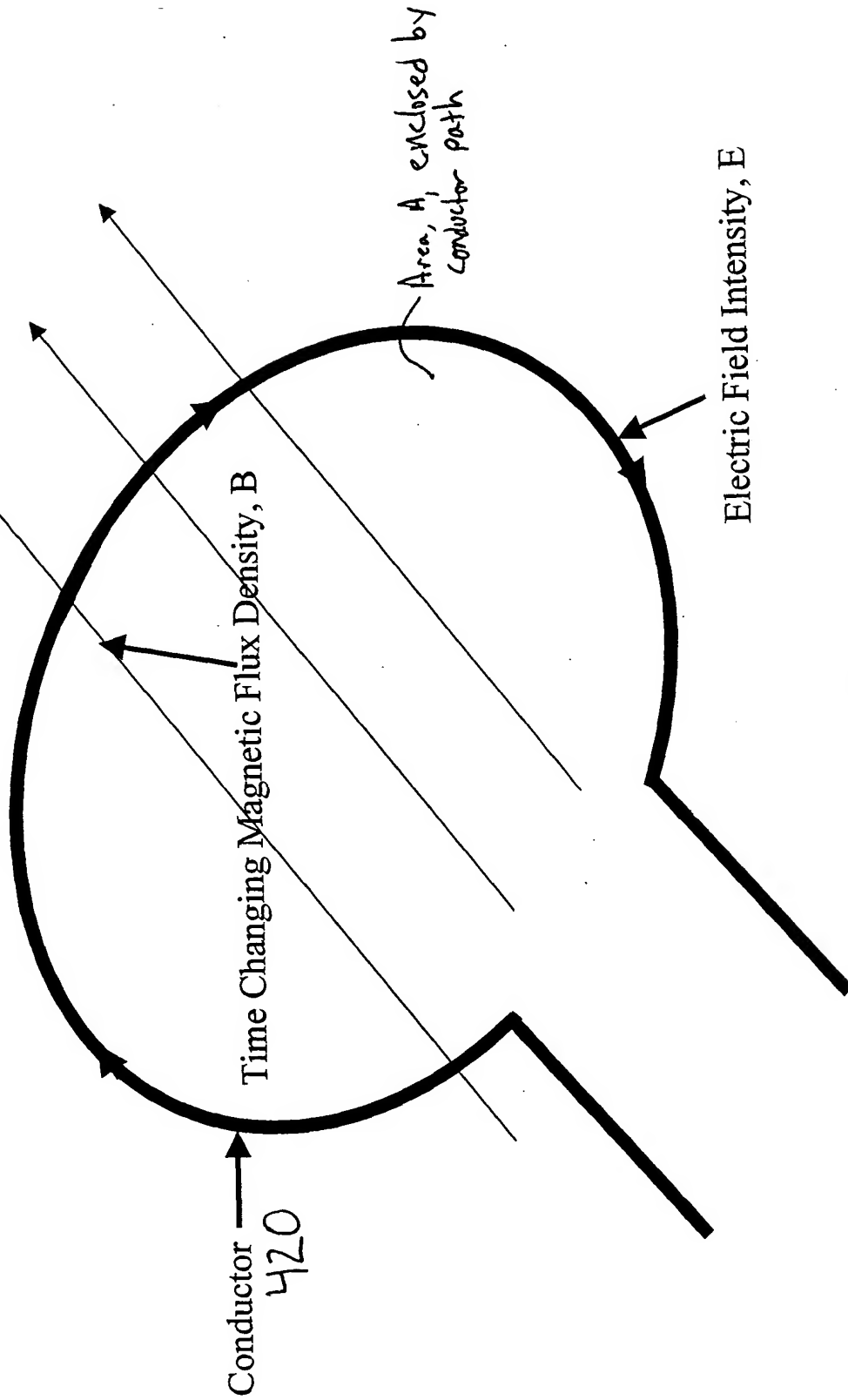


FIG. 24

40 cell cores in a ferromagnetic slab
with each energized by 1 current carrying conductor

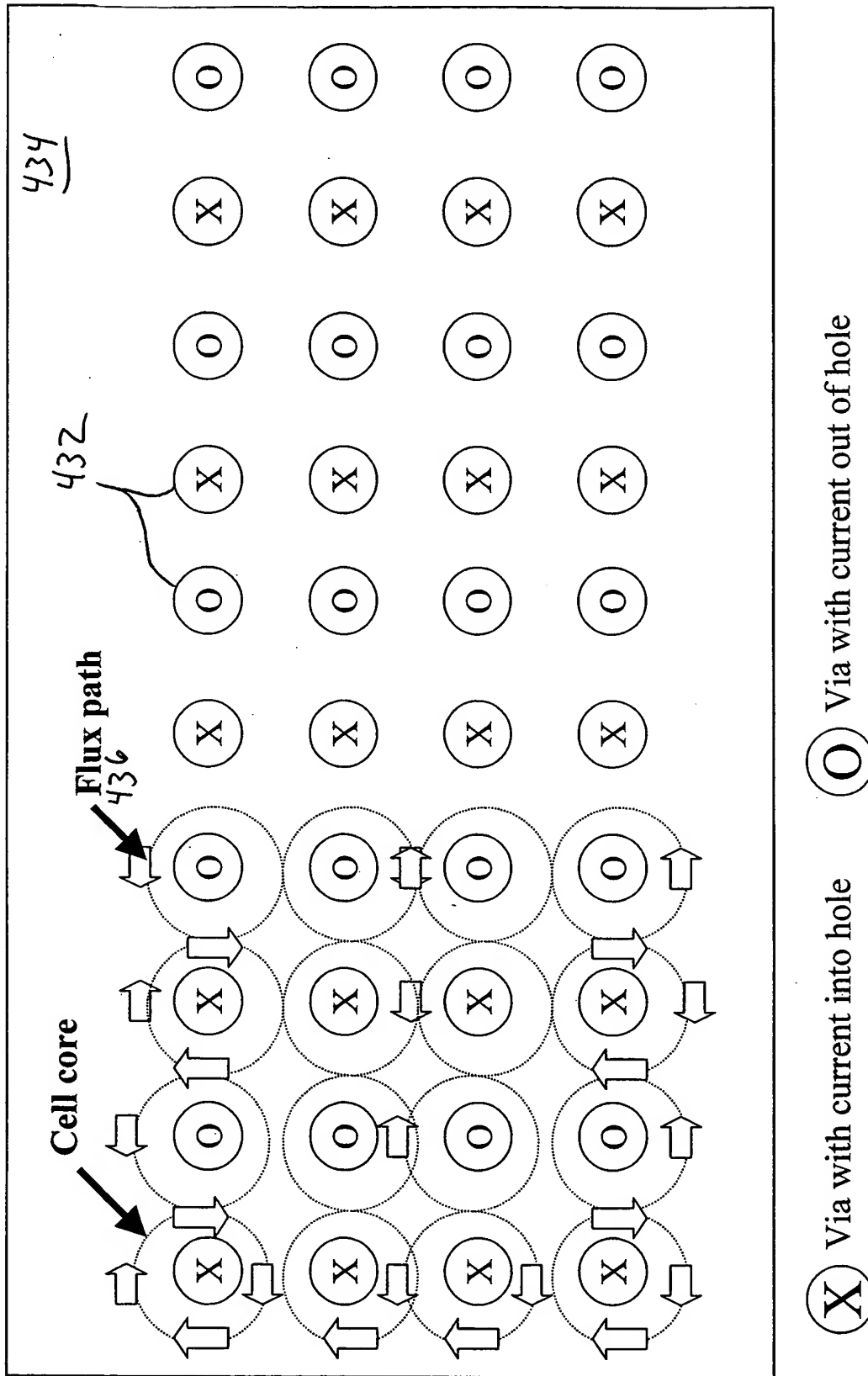
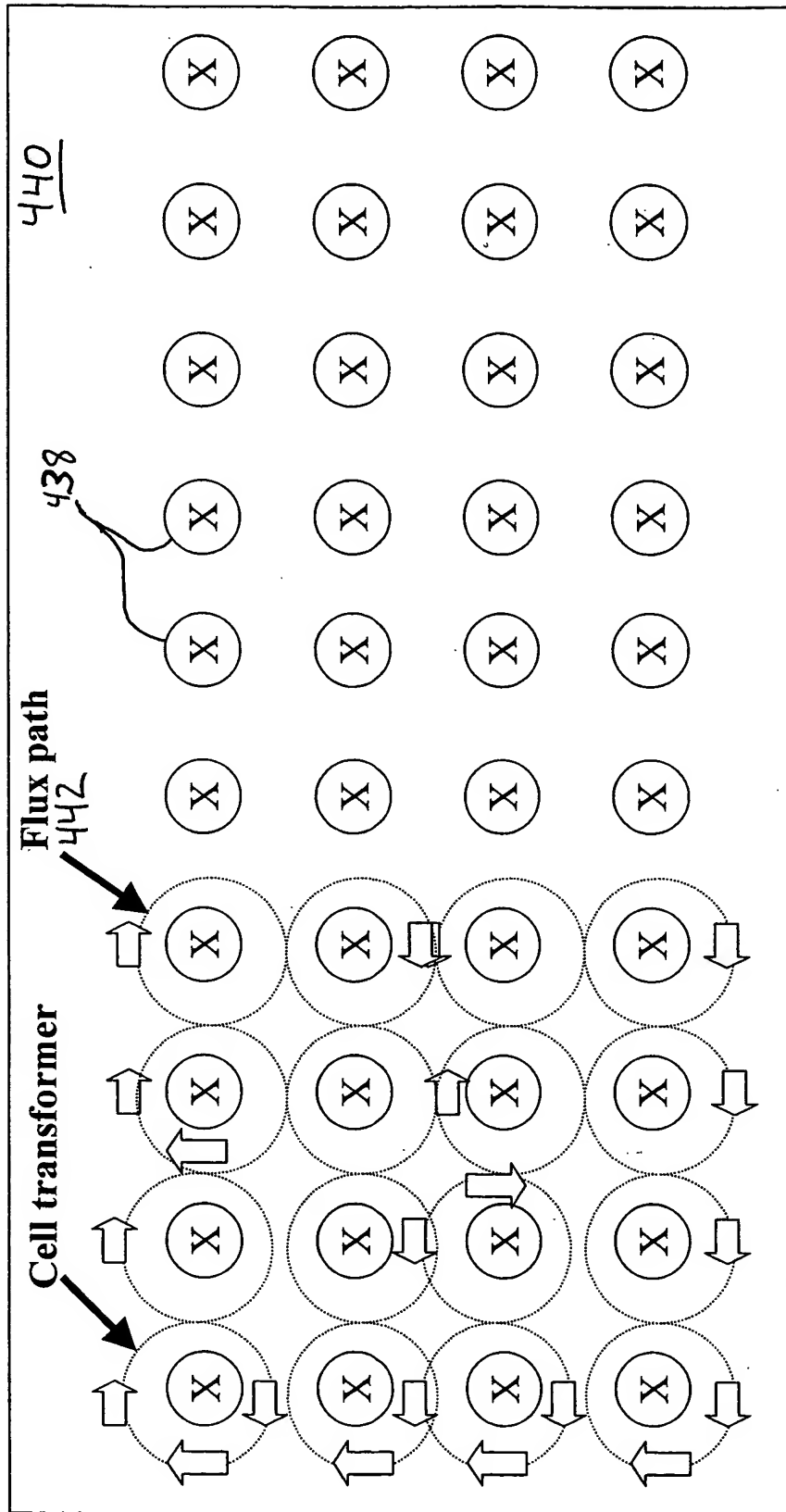


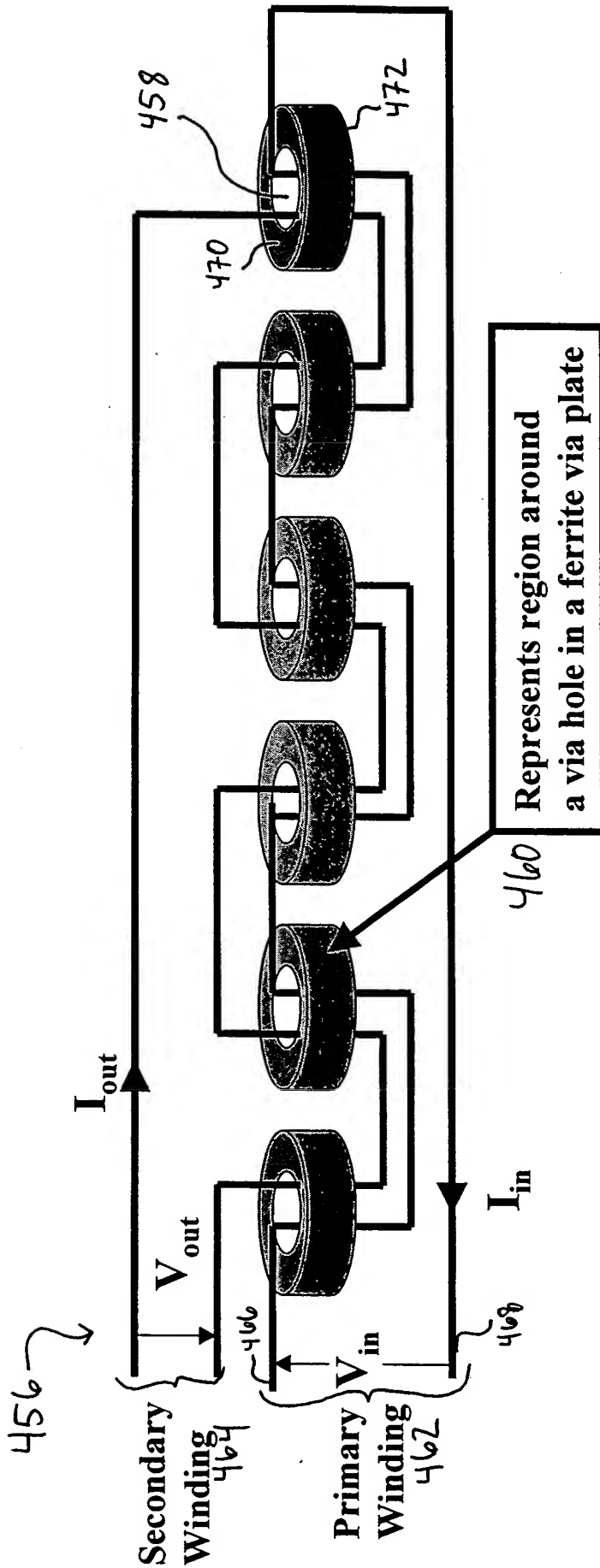
FIG. 25

40 cell cores in a ferromagnetic slab
with each energized by 1 current carrying conductor



⊗ Via with current into hole ⊙ Via with current out of hole

FIG. 26



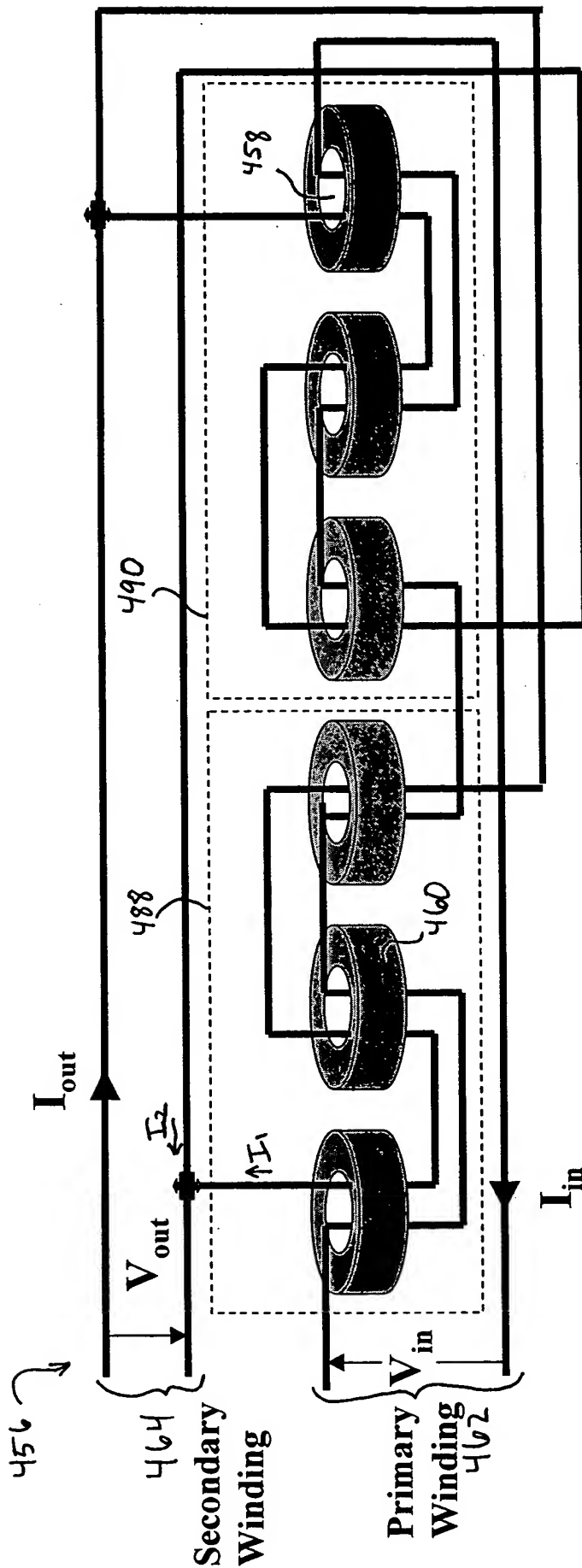
6 Cell Transformer
turns ratio=1 to 1
(primary to secondary)

$$V_{in} = V_{out}$$

$$I_{in} = I_{out}$$

Max current in Cell = I_{out}

FIG. 27



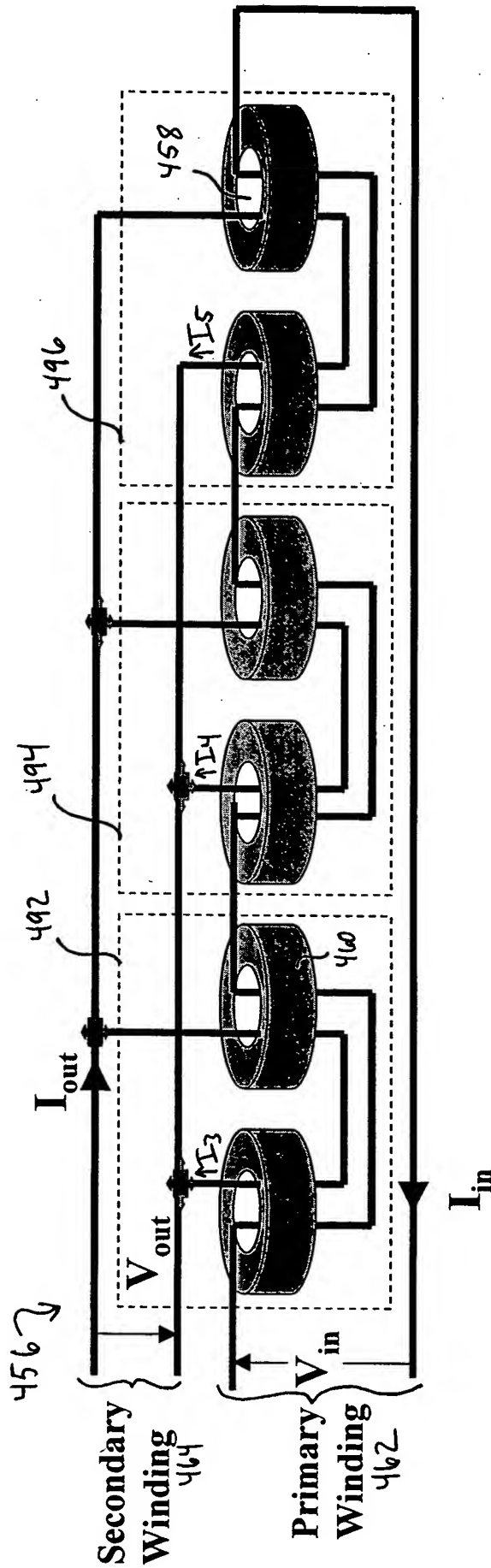
6 Cell Transformer
turns ratio=2 to 1
(primary to secondary)

$$V_{in} = 2 * V_{out}$$

$$I_{in} = 1/2 * I_{out}$$

$$\text{Max current in Cell} = 1/2 * I_{out}$$

FIG. 28



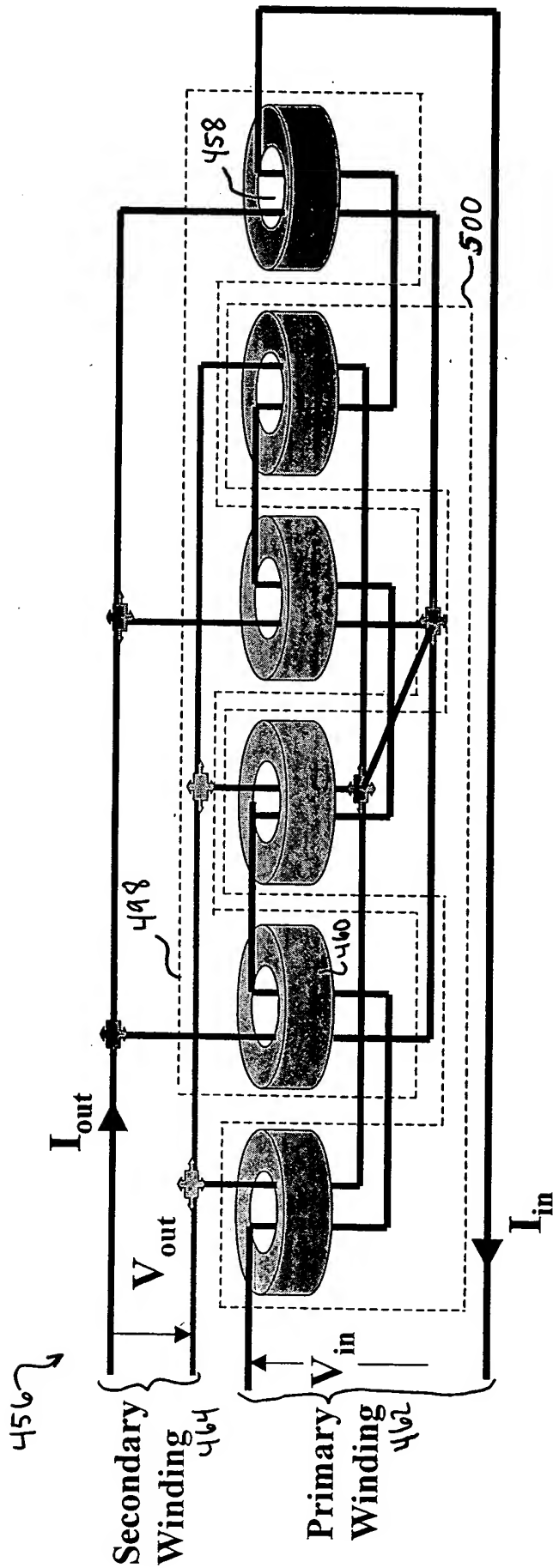
6 Cell Transformer
turns ratio=3 to 1
(primary to secondary)

$$V_{in} = 3 * V_{out}$$

$$I_{in} = 1/3 * I_{out}$$

Max current in Cell= $1/3 * I_{out}$

FIG. 29



6 Cell Transformer example
turns ratio=3 to 1
(primary to secondary)

$$V_{in} = 3 * V_{out}$$

$$I_{in} = 1/3 * I_{out}$$

Max current in Cell = $1/3 * I_{out}$

FIG. 30

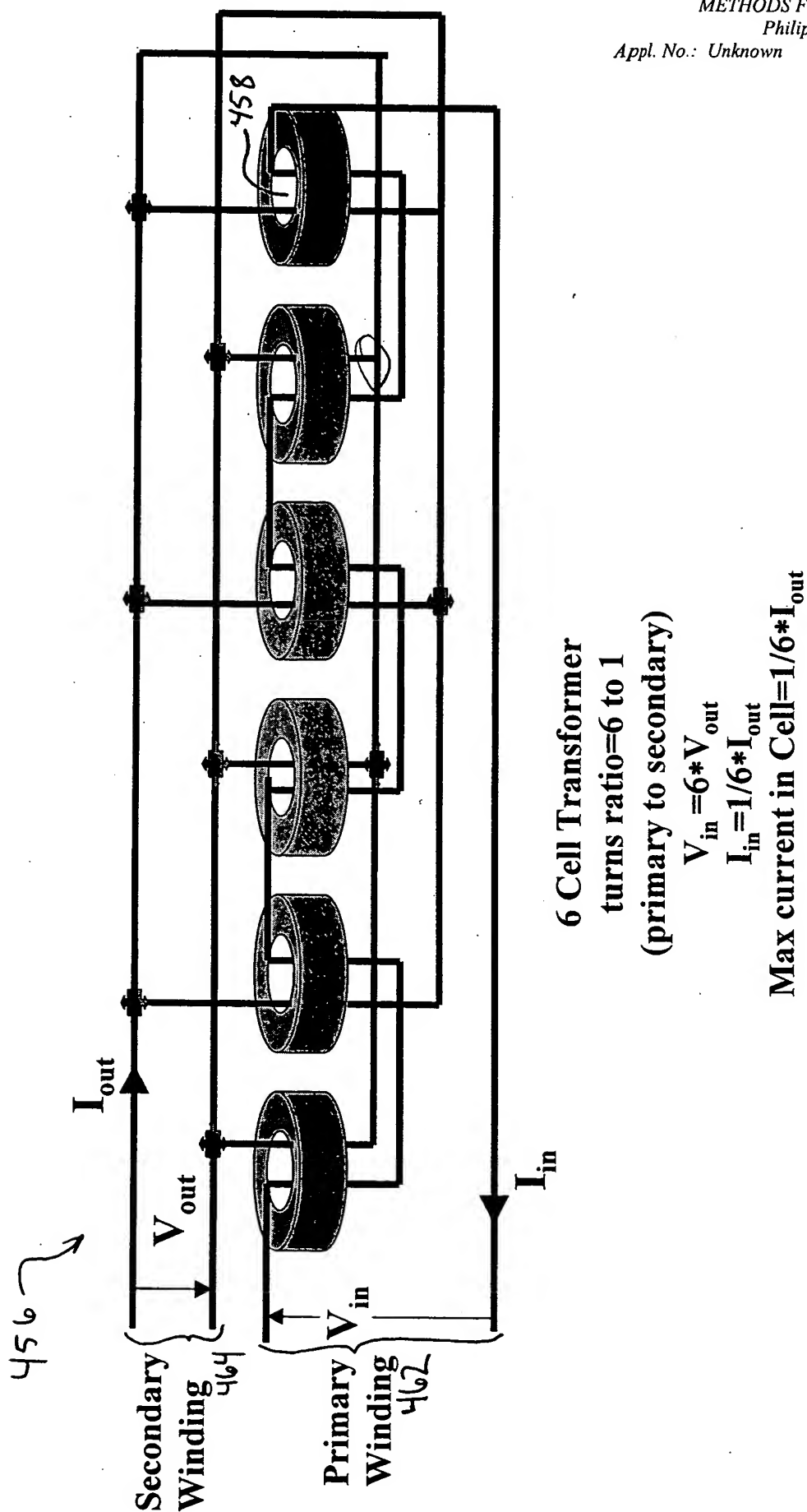


FIG. 31

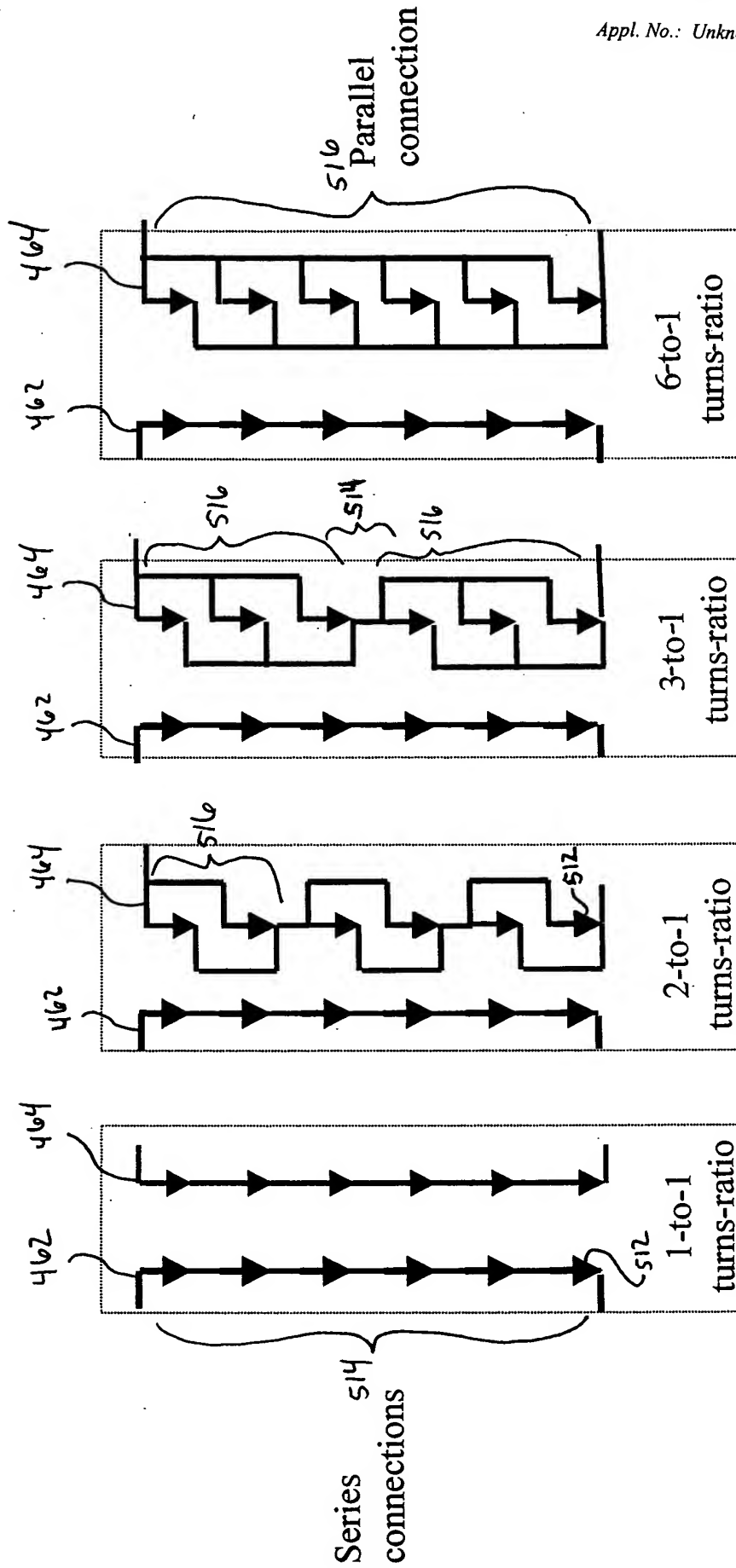


FIG. 32D

FIG. 32C

FIG. 32B

FIG. 32A

Symbolic Representation of 6 Cell
Transformer Connections

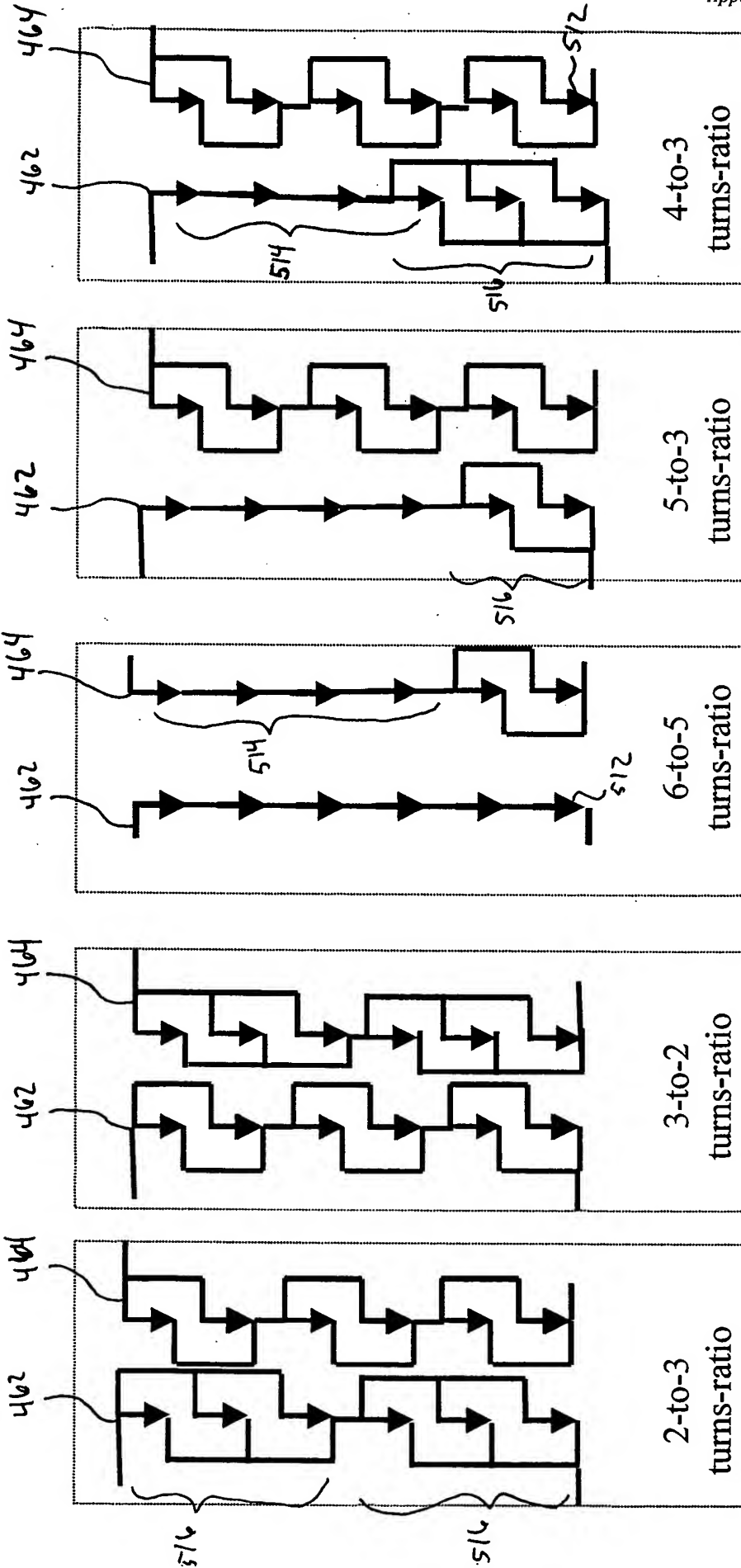


FIG. 32I

FIG. 32H

FIG. 32G

FIG. 32F

FIG. 32E

Additional Symbolic Representations of 6 Cell
Transformer Connections

Ferromagnetic slab with a 10 by 5 array of via holes



**4 via holes
in PCB area**
538

☒ Via with current into hole ☐ Via with current out of hole

FIG. 33A

Secondary High Current Connection of a 50 "Cell Core" Transformer

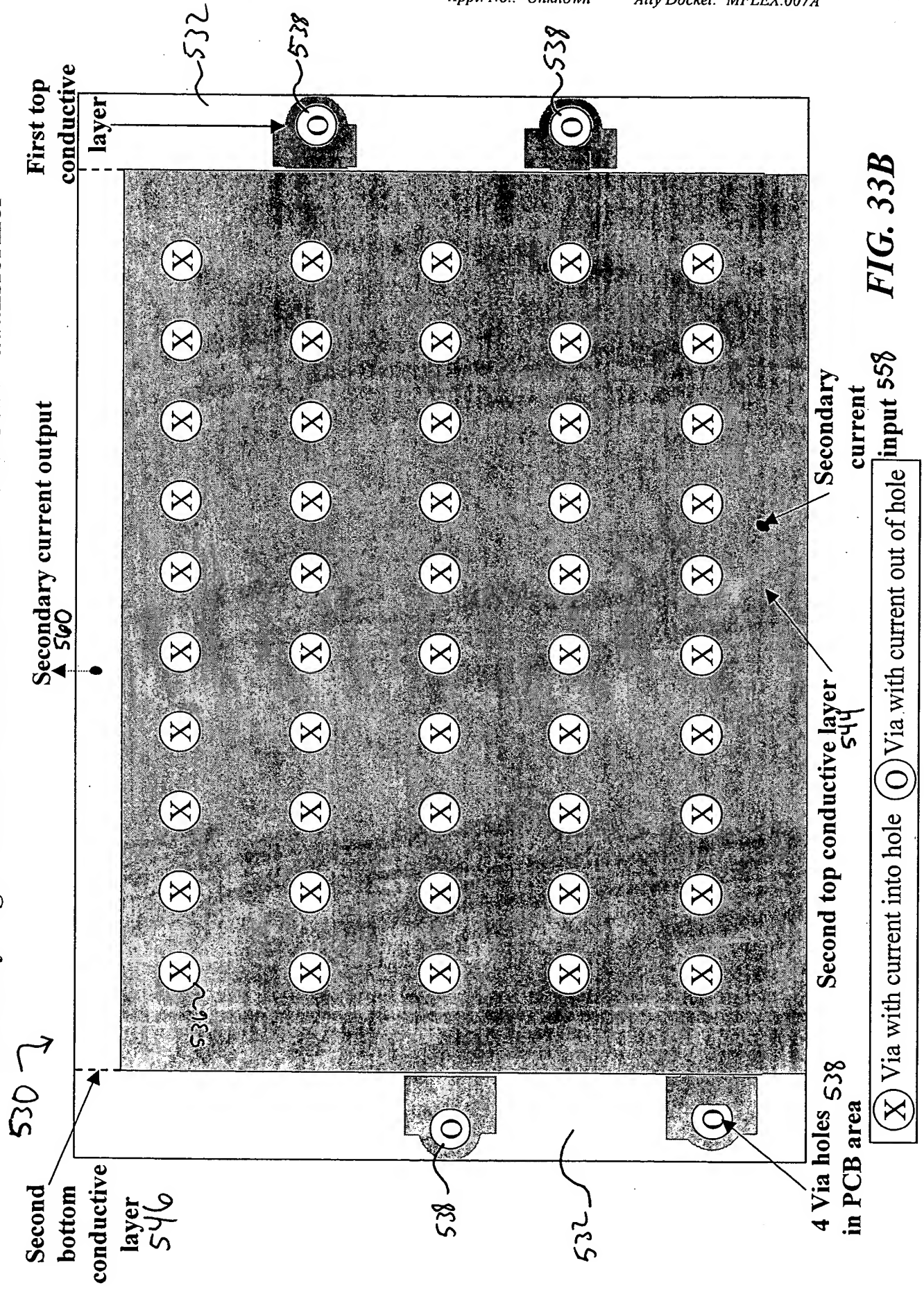


FIG. 33B

